

## Remarks

Claims 1-24 are pending. Claims 1, 9, 13, 15-17, and 19-21 are amended to more particularly point out and distinctly claim Applicants' invention.

The Examiner objected to the drawings because enforcer 707 is not shown in Figure 8, as disclosed on page 9, line 28. Applicants respectfully submit that the reference to Figure 8 on page 9, line 28, is a typographical error. That reference to enforcer 707 should have been a reference to Figure 4, as amended above. Accordingly, the Examiner's objection is believed overcome.

The Examiner objected to the Specification because the sentence at page 2, lines 13-14, misses the word "of." As amended, the Examiner's objection is believed overcome.

The Examiner rejected Claims 1-2 and 13-14 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,509,773<sup>1</sup> ("Buchwald"), in view of U.S. Patent 5,612,975 ("Becker"). The Examiner states:

Claim 1, Buchwald et al. discloses a loop (202 in Fig 3) compromising:

- Phase Detector (312, 314), receiving two input signals and outputting a phase difference
- Phase Control Signal Rotator (304), receiving said phase difference
- Phase Interpolator (306), receiving rotated signals and reference signals and outputting a linear combination of these signals. The output of the Interpolator is an internal signal to the Phase Detector (fig 4).

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<sup>1</sup> In the Examiner's various rejections under 35 U.S.C. § 103(a), the Examiner's reference to U.S. Patent 5,409,773 appears to be a mistake. U.S. Patent 5,409,77 is granted to Kessel et al. and appears not to relate to the subject matters of Applicants' claims. Applicants assume herein that the Examiner intended to refer to U.S. Patent 6,509,773, which is granted to Buchwald et al. and relates to a phase interpolator.

Buchwald fails to teach the quadrature output of the rotator; however Becker et al. teaches a rotator with quadrature output (fig 14). The output of the rotator in this teaching is periodic and is a function of the output of the phase detector (column 14 lines 12-20). It would be obvious to one of ordinary skill in the art at the time of the invention to incorporate Becker's teaching of using in phase and quadrature signals into Buchwald's loop apparatus it will increase the throughput of the output signal.

**Claim 2** inherits the same limitations of Claim 1; further Buchwald teaches a phase interpolator and rotator (fig 15, 15a, 15b, 16a, 16b, 16c) that can rotate signals in multiples of 45 degrees. This could be used to create both a first signal and quadrature signal to the output of the interpolator. Quadrature output will increase throughput of the interpolator, and has common uses in the art such as in PSK and QAM modulation. Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to incorporate Buchwald's teaching on quadrature signal creation into the combined teachings of Becker and Buchwald.

**Claim 13** has the same limitations from Buchwald et al. in view of contains the same limitations of Claim 1.

**Claim 14** contains the same limitations of Claim 2.

Applicants respectfully traverse the Examiner's rejection. As amended, Claims 1 and 13 recite adjusting the amplitudes of the first and the second periodic signals:

1. (Currently amended) A phase-locked loop, comprising:

a phase detector receiving an input signal and a first internal periodic signal and providing a phase signal indicative of a phase difference between said input signal and said first internal periodic signal;

a rotator receiving said phase signal and providing a first periodic signal and a second periodic signal each having a period being a function of said phase difference, said first and said second periodic signals being 90 degrees out of phase relative to each other, said rotator further comprising an enforcer which adjusts the amplitudes of the first periodic signal and the second periodic signal to within predetermined limits; and

an interpolator circuit linearly combining said first and second periodic signals with a third periodic signal and a fourth periodic signal to provide said first internal periodic signal.

\* \* \*

13. (Currently amended) A method for providing a phase-locked loop, comprising:

receiving an input signal and a first internal periodic signal and providing a phase signal indicative of a phase difference between said input signal and said first internal periodic signal;

receiving said phase signal and providing a first periodic signal and a second periodic signal each having a period being a function of said phase difference, said first and said second periodic signals being 90 degrees out of phase relative to each other;

adjusting the amplitudes of the first periodic signal and the second periodic signal to within predetermined limits; and

linearly combining said first and second periodic signals with a third periodic signal and a fourth periodic signal to provide said first internal periodic signal.

Such adjustments to the first and second periodic signals are disclosed or suggested by neither Buchwald nor Becker. Accordingly, Applicants respectfully submit that Claims 1 and 13 and their respective dependent Claims 2 and 14 are allowable over Buchwald and Becker, individually and in combination. Reconsideration and allowance of Claims 1-2 and 13-14 are therefore requested.

The Examiner rejected Claim 3 under 35 U.S.C. 103(a) as being unpatentable over Buchwald, in view of Becker, and U.S. Patent 5,193,224 ("McNicol"). The Examiner states:

**Claim 3**, inherits the limitations of Claim 1; further McNicol discloses a Phase detector connected to a Low Pass Filter and then connected to a Rotator (fig 1). The low pass filters is generally used after the phase detector to integrate the phase error and would be obvious to one of ordinary skill in the art at the time of the invention to incorporate in Buchwald's

apparatus.

Applicants respectfully traverse the Examiner's rejection. Since Claim 3 depends from Claim 1, Claim 3 is allowable over Bachwald and Becker for the reasons stated above with respect to Claim 1. McNicol provides no teaching in the direction of the amplitude adjustments recited in Claim 1. Thus, Claim 3 is allowable over Bachwald, Becker and McNicol, whether considered individually or in combination. Reconsideration and allowance of Claim 3 are therefore requested.

The Examiner rejected Claim 4 under 35 U.S.C. § 103(a) as being unpatentable over Buchwald, in view of Becker and U.S. Patent 5,584,065 ("Monzello"). The Examiner states:

**Claim 4**, inherits the limitations of Claim 1; further Monzello discloses the use of an Integrator in a Rotator (fig 3). The integrator is used in the rotator to increase the voltage of the control signals in the rotator to create aligned quadrature signals and would be obvious to one of ordinary skill in the art at the time of the invention to incorporate in Buchwald's apparatus.

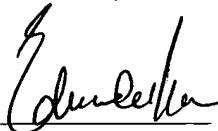
Applicants respectfully traverse the Examiner's rejection. Since Claim 4 depends from Claim 1, Claim 4 is allowable over Bachwald and Becker for the reasons stated above with respect to Claim 1. Monzello provides no teaching in the direction of the amplitude adjustments recited in Claim 1. Thus, Claim 4 is allowable over Bachwald, Becker and Monzello, whether considered individually or in combination. Reconsideration and allowance of Claim 4 are therefore requested.

The Examiner rejected to Claims 15-24 under 35 U.S.C. § 112, second paragraph as being indefinite, stating that Claims 15-24 are method claims that depend from an apparatus claim. As amended, Claims 15-24 now depend from method Claim 13. The Examiner's rejection is believed overcome.

The Examiner indicated allowable subject matter in Claims 5-12.

For the reasons set forth above, Applicant submit that all pending claims (i.e., Claims 1-24) are allowable, and respectfully request their allowance. If the Examiner has any questions regarding the above, the Examiner is respectfully request to telephone the undersigned Attorney for Applicant at 408-392-9250.

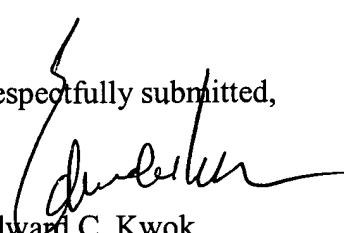
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Date of Signature

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